Meeting Minutes Transmittal

Unit Managers' Meeting
Hanford Patrol Academy Demolition Sites Closure Plan
2440 Stevens Center, Room 2100
Richland, Washington

Meeting Held March 21, 1995
From 8:30 to 10:00 AM

The undersigned indicate by their signatures that these meeting minutes reflect the actual occurrences of the above dated Unit Managers Meeting.

Ellen Mattlin Date: 4/25/95
Ellen M. Mattlin, Unit Manager, RL

NOT PRESENT
Date:
Daniel L. Duncan, RCRA Program Manager, EPA Region 10

Fenggang Ma Date: 4/25/95
Fenggang Ma, Unit Manager, Washington State Department of Ecology

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Hanford Patrol Academy Demolition Sites Closure Plan, WHC Concurrence

Fred A. Ruck III Date: 4/25/95
Fred A. Ruck III, Contractor Representative, WHC

Purpose: Discuss Permitting Process

Meeting Minutes are attached. The minutes are comprised of the following:
Attachment 1 - Agenda
Attachment 2 - Summary of Discussion and Commitments/Agreements
Attachment 3 - Attendance List
Attachment 4 - Action Items
Attachment 5 - Napalm Evaporation Calculation

Attachment 1

Unit Managers' Meeting
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Agenda

1. Approval of Past UMM Minutes (Ecology/RL/EPA/WHC)

2. Status Action Items
   - None

3. Status Closure Activities

4. New Business

5. Set Next Meeting Date

Attachment 2

Unit Managers' Meeting
Hanford Patrol Academy Demolition Sites Closure Plan
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Richland, Washington

Meeting Held March 21, 1995
From 8:30 to 10:00 AM

Summary of Discussion and Commitments/Agreements

1. **Approval of Past UMM Minutes (Ecology/RL/EPA/WHC):**

   The February 14, 1995, Unit Managers' Meeting Minutes will be signed by the Unit Managers' at the April 1995 UMM.

2. **Status Action Items:**

   -None

3. **Status Closure Activities:**

   WHC (R. K. Bhatia) handed out the results of a risk assessment on a napalm canister that may have been buried on or near the HPADS. The calculation showed that after nearly 20 years the canister would not contain any active napalm that would present a risk to human health or the environment.

   Ecology (F. Ma) stated that with the approval of the napalm risk assessment, there were no outstanding issues associated with HPADS and the HPADS Closure Plan would be included in Hanford Facility Permit, Modification A'.

4. **New business:**

   -None

5. **Set new meeting date:**

   The next Unit Managers Meeting was scheduled for 8:00 AM on April 25, 1995.

Attachment 3

Unit Managers' Meeting
Hanford Patrol Academy Demolition Sites Closure Plan
2440 Stevens Center Place, Room 2100
Richland, Washington

Meeting Held March 21, 1995
From 8:30 to 9:30 a.m.

Note: A stenographer is present to take detailed notes on the proceedings of this meeting. These notes will be used for the sole purpose of preparing unit manager meeting minutes. After these unit manager meeting minutes are finalized, the detailed notes will be discarded. If any attendee has objections with this approach, they should voice these objections at this time.

Attendance List

Name	Organization	Phone #
Ravi K. Bhatia	RCRA Closures	372-2720
Dorothy M. Kraemer-Duncan	WHC- RCRA Closures	376-2628
Paul Macbeth	GSSC - SWT	372-2289
Joe Waring	DOE-RL	373-7687
Fenggang Ma	Ecology	736-3035
Kathy Knox	WHC	372-3596
Bob Bells	WHC-G&WAS	372-0705

Attachment 4

Unit Managers' Meeting
Hanford Patrol Academy Demolition Sites Closure Plan
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Meeting Held March 21, 1995
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Action Items

Action Item #	Description
- None	

Attachment 5

Unit Managers' Meeting
Hanford Patrol Academy Demolition Sites Closure Plan
2440 Stevens Center, Room 2100
Richland, Washington

Meeting Held March 21, 1995
From 8:30 to 10:00 AM

NAPALM EVAPORATION CALCULATION

ATTACHMENT 5

NAPALM EVAPORATION CALCULATION

PERFORMED BY

RAVI K. BHATIA

SUBMITTED TO

FENGGANG MA, ECOLOGY

We, the undersigned, certify that the information contained within was performed using accurate scientific principles and available information regarding the burial of the napalm canister.

Approved by: Ravi K. Bhatia — 3/22/95
R. K. Bhatia
Westinghouse Hanford Company
RCRA Unit Closures

F. A. Ruck III — 3/22/95
F. A. Ruck III
Westinghouse Hanford Company
Manager, RCRA Unit Closures

Verified by: J. D. Hoover — 3/22/95
J. D. Hoover
Westinghouse Hanford Company
Fellow Scientist, Environmental Modeling

Date

DON'T SAY IT --- Write It!

DATE: March 21, 1995

TO: Fenggang Ma, Ecology

FROM: Ravi K. Bhatia, WHC

Telephone: 372-2720

cc: J. K. Bartz
R. E. Bolls
C. E. Clark
J. D. Hoover
P. J. MacBeth
E. M. Mattlin
F. A. Ruck III
S. M. Price
J. J. Waring

SUBJECT: RISK ASSOCIATED WITH THE NAPALM CANISTER AT THE HANFORD PATROL ACADEMY DEMOLITIONS SITE

This correspondence is in response to a concern raised by Mr. Fenggang Ma at the January 27, 1995 Hanford Patrol Academy Demolition Sites (HPADS) Unit Managers' Meeting. Specifically, Mr. Ma requested that the U.S. Department of Energy, Richland Operations Office (RL) assess the risk associated with a napalm canister that might have been buried on or near the Hanford Patrol Academy Demolition Sites. The attachment contains the assumptions and the evaporation rate model that was used in determining the risk associated with the napalm canister.

The evaporation model conservatively estimates that any residual volatile component of napalm would have evaporated within 4 to 6 years of burial, in 1975. The HPADS Closure Plan states that the napalm canister was buried after it failed to detonate or ignite. This statement, with the supporting evaporation model, indicates that it is extremely unlikely that the canister still contains active napalm that would present a risk to human health and the environment.

Since the attempted destruction of the napalm canister predates submittal of a Part A Permit Application, as well as RCRA Regulations, it is not associated with HPADS operation or closure. Therefore, pending final verification of the HPADS soil sampling and analysis data, Ecology and RL should proceed with clean closure activities of the HPADS and incorporate the HPADS in the Hanford Facility Permit, Modification A', by April 15, 1995.

Should you have any further questions please contact Ms. E. M. Mattlin, RL, on (509)376-2385 or Mr. F. A. Ruck III, WHC, on (509)376-9876.

BACKGROUND

As stated in the HPADS Closure Plan, in 1975 a metal canister of napalm B[1] was used as a rifle target during a training exercise. The napalm canister was shot repeatedly and failed to detonate. A subsequent attempt was made to ignite the canister with direct flame, which failed. The canister was then crushed underfoot and buried on one of the firing ranges, approximately 3 feet (1 meter) below surface. The specific location of the canister is unknown. It is believed that at the time of the training exercise, the gasoline was no longer in the gel matrix of the napalm or the canister may have been empty.

BASIS

The time required for evaporation is included in Attachment A. The calculation was performed with the following assumptions:

- modeled as diffusion through stagnant gas film[2]
- steady-state evaporation
- annual average soil temperature 60°F
- napalm consists of inert gel and gasoline (leaded)
- 1 quart of napalm modeled as pure n-hexane (C_6H_{14})
- liquid component, n-hexane held in gel matrix (e.g., evaporation sole pathway)
- no resistance to n-hexane transport in gel matrix
- soil porosity=0.35 and soil tortuosity=0.6[3]
- no soil retardation effects
- napalm container suffered 4 direct hits

As mentioned earlier, the canister was shot at repeatedly and then crushed underfoot, making it difficult to determine the actual cross sectional area through which evaporation of n-hexane can occur. However, a conservative estimate of the effective cross-sectional area was developed based on the entrance and exit bullet holes. Only direct hits that would cause an entrance and exit hole were considered. The total area through which evaporation can occur is the sum of the areas from the entrance and exit holes. Assuming four direct hits, the n-hexane would take 4.1 years to evaporate when buried 2 feet and 6.2 years to evaporate when buried 3 feet below the ground surface.

CALCULATION

The attached spreadsheet summarizes the results of the evaporation calculation.

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[1]A full canister of napalm B would have been about the size of a 1-quart container.

[2]R. B. Bird, W. E. Stewart, and G. N. Lightfoot, Transport Phenomena, New York: Wiley, 1960, pp 522-525

[3]P. A. Domenico and F. W. Schwartz, Physical and Chemical Hydrogeology, New York, Wiley, 1990, pp 26 and 368

The evaporation rate of gasoline from the napalm canister is obtained using the following equation:

Eq. 1

$$N_A = \frac{C_o D_{eff}}{(z_2 - z_1)} \frac{(y_{A1} - y_{A2})}{(y_B)_{lm}}$$

- C_o = concentration of gasoline at canister-soil interface [lb/ft3]
- D_{eff} = diffusion coefficient [ft2/day]
- y_{A1} = mole fraction gasoline at canister
- y_{A2} = mole fraction gasoiline in bulk soil
- $(y_B)_{lm}$ = log mean concentration of soil-air
- $z_2 - z_1$ = burial depth of canister [ft]

The effective difusion coefficient is calculated according to

Eq. 2

$$D_{eff} = D_{AB} \frac{\varepsilon}{\tau}$$

- ε = soil porosity
- τ = soil tortuosity

where

Eq. 3

$$D_{AB} = 0.0018583 \frac{\sqrt{T^3\left(\frac{1}{M_A} + \frac{1}{M_B}\right)}}{p\sigma_{AB}^2\Omega_{D,AB}}$$

- σ_{AB}^2 =Lennard-Jones Parameters
- $\Omega_{D,AB}$ =dimensionless function of temperature and intermolecular potential

Deff=	diffusion coefficient of gasoline through soil-air	Subscript A = hexane	
Dab=	diffusion coefficient of gasoline through air	Subscript B = stagnant air	

Assumptions:

1 qt gasoline held in gel matrix

evaporation is the only mechanism for transport (i.e., gasoline held in gel matrix)

mole fraction gasoline in bulk soil is zero

gasoline modeled as n-hexane			mw air =	28	g/mole
vapor pressure gasoline=	0.46	atm	mw hexane =	86	g/mole
density liquid	5.86	lb/gal	P =	1	atm
soil porosity (sand)=	0.35		T=	60	F
soil tortuosity (sand)=	0.6			289	K
burial depth of canister =	2	ft		519	R
Volume hexane=	0.25	gal			

					sigma(A)=	sigma hexane =	5.91	
Calculation of D ab					sigma(B)=	sigma air =	3.62	
D AB=	0.05	cm2/sec	**Eq. 3**		sigma(AB)=	sigma air-hex=	4.77	
	4.75	ft2/day			e/k (A)=	e/k hexane =	413	
					e/k (B)=	e/k air =	97	
Deff=	2.77	ft2/day	**Eq. 2**					
					e/k (A-B)=	e/k hex-air=	200.15	
Concentration of hexane at the soil-hexane interface:								
C o =	mw*psat/RT				kT/e (A-B)=	kT/e hex-air =	1.44	
	0.10	lb/ft3				From Table B-2 of BSL		
						omega ab=	1.22	
Mole Fraction Hexane			**Mole Fraction Air**			Log Mean Conc. Difference Mole Fraction Air		
yA1=	0.46		yB1=	0.54		yB lm=	0.75	
yA2=	0		yB2=	1				
The hexane flux is then calculated according to Eq. 1:								
N hexane =	8.91E-02	lb/ft2-day						
Time required for napalm to evaporate based on cross-sectional area of container:								
T=(Volume*density)/(flux*area)				Container Diameter=	4	in.		
				Cross Sectional Area=	0.09	ft2		
T evap=	**0.52**	**yr**	**at 2 ft depth**	NOTE:The napalm canister was shot at repeatedly and then crushed under-				
				foot making it difficult to determine the actual cross sectional area (CSA).				
T evap=	**0.77**	**yr**	**at 3 ft depth**	The area for this calculation is based on the CSA of an undamaged 1 qt.				
NOTE: NAPALM CANISTER WAS BURIED IN 1975				container (i.e., 1 qt. oil container).				

Time required for napalm to evaporate based on cross-sectional area of bullet hole:

dia. hole=	0.5	inches
	4.17E-02	ft
area hole	1.36E-03	ft2

Napalm Canister at 2 ft Depth.

Number Hits	Number Holes	Area (ft2)	Time (yr)
1	2	2.73E-03	16.5
2	4	5.45E-03	8.3
3	6	8.18E-03	5.5
4	8	1.09E-02	4.1
5	10	1.36E-02	3.3
6	12	1.64E-02	2.8
7	14	1.91E-02	2.4
8	16	2.18E-02	2.1

NOTE: NAPALM CANISTER WAS BURIED IN 1975

Napalm Canister at 3 ft Depth.

Number Hits	Number Holes	Area (ft2)	Time (yr)
1	2	2.73E-03	24.8
2	4	5.45E-03	12.4
3	6	8.18E-03	8.3
4	8	1.09E-02	6.2
5	10	1.36E-02	5.0
6	12	1.64E-02	4.1
7	14	1.91E-02	3.5
8	16	2.18E-02	3.1

Distribution

J. K. Bartz	MACTEC	B1-42
R. K. Bhatia	WHC	H6-23
R. E. Bolls	WHC	T3-04
B. J. Broomfiled	WHC	H3-16
R. M. Carosino	RL	A4-52
D. L. Duncan	EPA	HW-106 (Seattle)
D. M. Korematsu-Olund	WHC	H6-23
J. G. Lucas	WHC	H6-04
F. Ma	Ecology	B5-18
P. J. Mackey	WHC	B3-15
P. Macbeth	MACTEC	R3-82
E. M. Mattlin	RL	A5-15
R. D. Pierce	WHC	T3-04
S. M. Price	WHC	H6-23
M. R. Romsos	WHC	T3-04
W. A. Skelly	WHC	H6-03
F. A. Ruck III	WHC	H6-23
J. L. Waite	WHC	B2-35
J. J. Waring	RL	S7-55
Field Custodian	WHC	H6-08
GHL/RCRA File	WHC	H6-23

ADMINISTRATIVE RECORD: Hanford Patrol Academy Demolition Sites Closure Plan, T-11-1. [Care of EDMC, WHC (H6-08)]

Washington State Department of Ecology Nuclear and Mixed Waste Hanford Files, P.O. Box 47600, Olympia, Washington 98504-7600

Environmental Protection Agency Region 10, Seattle, Washington 98101, Mail Stop HW-074 (Record Center)

Please send comments on distribution list to Ravi K. Bhatia (H6-23), 372-2720.